

SILAGE RUNOFF STORAGE POND LINER SEEPAGE CALCULATIONS

IN ACCORDANCE WITH 327 IAC 16-8-7, NEW EARTHEN MANURE STORAGE STRUCTURES MUST HAVE A SEEPAGE RATE THAT DOES NOT EXCEED 1/16 INCH PER DAY.

SINCE THIS FACILITY WILL BE USING THE INSITU SOIL TO DETERMINE THAT THE MINIMUM SEEPAGE RATE IS BEING MET, DETERMINE THE SEEPAGE RATE THROUGH 2 FEET OF NATURAL SOIL (2 FEET IS THE MINIMUM IDEM SOIL THICKNESS REQUIREMENT). NOTE THAT THE ACTUAL AMOUNT OF SOIL BENEATH THE BASE OF THE POND IS MUCH GREATER THAN THE TWO FEET.

USE THE PROCEDURE IN APPENDIX 10D OF THE AWMFH WITH A MAXIMUM ALLOWABLE SPECIFIC DISCHARGE (SEEPAGE) OF 1/16 INCH PER DAY (0.0625 IN/DAY).

GIVEN POND FILL DEPTH AND INSITU PERMEABILITY, USING DARCY'S LAW FORMULA FROM THE ABOVE REFERENCE:

$$Q = k \left(\frac{H}{L} \right) \quad \text{(DARCY'S LAW)}$$

WHERE:

- Q = SEEPAGE
- k = COEFFICIENT OF PERMEABILITY (AVERAGE HYDRAULIC CONDUCTIVITY OF INSITU SOIL FROM BORING TB-4 (2.04 x 10^-8 cm/sec))
- H = VERTICAL DISTANCE MEASURED BETWEEN THE TOP OF LINER AND THE DESIGN WATER LEVEL (OPERATING LEVEL) OF THE WASTE IMPOUNDMENT (8.0 FEET MAX)
- L = MINIMUM THICKNESS OF THE SOIL (2 FEET)

Q = 0.0038 IN PER DAY WHICH IS LESS THAN THE REGULATORY MINIMUM REQUIREMENTS.

Silage Pond Required Volume Worksheet-Milco Dairy, LLC

1. Normal Precipitation

a. Average precipitation less evaporation on the storage pond and settling basin

Month	Precipitation (in)	Evaporation (in)	30 yr avg net (in)
January	1.89	1.02	0.87
February	1.84	1.02	0.82
March	2.89	1.36	1.53
April	3.50	3.06	0.44
November	3.23	1.36	1.87
December	2.68	1.02	1.56
Totals	15.73	8.84	6.89

Silage Pond area = 1.14 acres
Total Area = 1.14 acres
Net collected = 28,512 ft³

b. Normal runoff from Silage Pad

Month	Runoff (in)	Runoff area (inches)
January	1.89	15.73
February	1.84	3.21
March	2.89	11.80
April	3.50	3.21
November	3.23	11.80
December	2.68	3.21
Totals	15.73	137,468

2. 25 Year Precipitation

a. 25-year 24-hour precipitation on pond surface

Month	Precipitation (in)	Runoff area (inches)
January	4.6	19,036
February	1.14	19,036
March	4.6	19,036
April	1.14	19,036
November	4.6	19,036
December	1.14	19,036
Totals	19,036	19,036

b. Runoff 25-year 24-hour storm from Silage Pad

25-year 24-hour storm rainfall	Runoff area	Runoff Curve Number	Runoff	Total runoff
4.6	3.21	96	4.36	50,804
SUBTOTAL	50,804	50,804	50,804	50,804

a. Leachate seepage

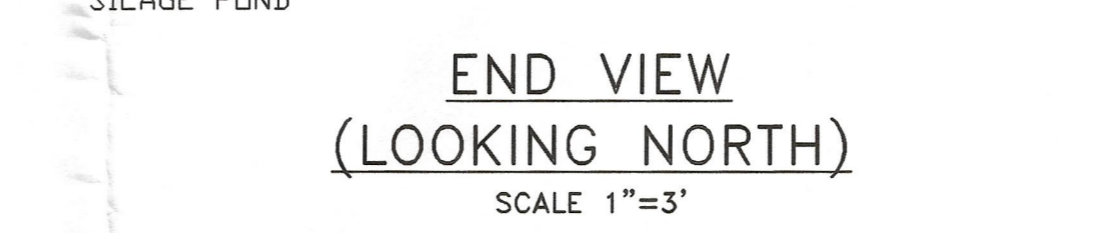
Seepage	Silage storage per acre	Silage storage area	Silage Leachate Seepage Volume
1.0	21500	2.57	55,255
SUBTOTAL	55,255	55,255	55,255

REQUIRED STORAGE VOLUME FROM DAIRY OPERATIONS (ft³) 291,075
2,177,241

Milco Dairy Silage Pond Storage Volumes (Proposed Pond)

ELEVATION CONTOUR	CONTOUR AREA	AVERAGE AREA	HEIGHT BETWEEN	INCREMENTAL STORAGE VOLUME	CUMULATIVE FROM BOTTOM (CUBIC FEET)	CUMULATIVE FROM BOTTOM (GALLONS)
1070	26295.04	28352	2	56704	56704	424147
1072	30409.11	32604	2	65207	121911	911895
1074	34797.89	37130	2	74259	196170	1467355
1076	39481.38	41930	2	83861	280031	2094835
1078	44399.57	45886	2	92463	372494	2819398
1079	46971.68	45886	1	45886	418380	3177861

NOTE: PRIOR TO CONSTRUCTION OF THE SILAGE POND, THE CONTRACTOR WILL EXCAVATE TEST PITS OUTSIDE THE POND AREA TO A DEPTH OF AT LEAST ELEVATION 1068 TO DETERMINE THE PRESENCE OR ABSENCE OF ANY SAND/SILT SEAMS OR GROUNDWATER THAT COULD IMPACT THE ABILITY TO CONSTRUCT THE POND AS DESIGNED. THE INFORMATION WILL BE GIVEN TO THE DESIGN ENGINEER WHO WILL CONFIRM THE DATA. ANY NEEDED CHANGES WILL BE SENT TO IDEM.



SILAGE LEACHATE COLLECTION SYSTEM DETAILS

SILAGE PAD LEACHATE COLLECTION SYSTEM DESIGN

DETERMINE PEAK DISCHARGE FLOW FROM SILAGE PAD (2.5 ac). USE THE 25 YEAR, 24 HOUR STORM EVENT

A) METHOD: 1. RATIONAL METHOD, 10 MINUTE DURATION

$$Q = CIA$$
$$Q = (0.90)(7.1 \text{ in/hr})(2.5 \text{ ac}) = 16.0 \text{ cfs}$$

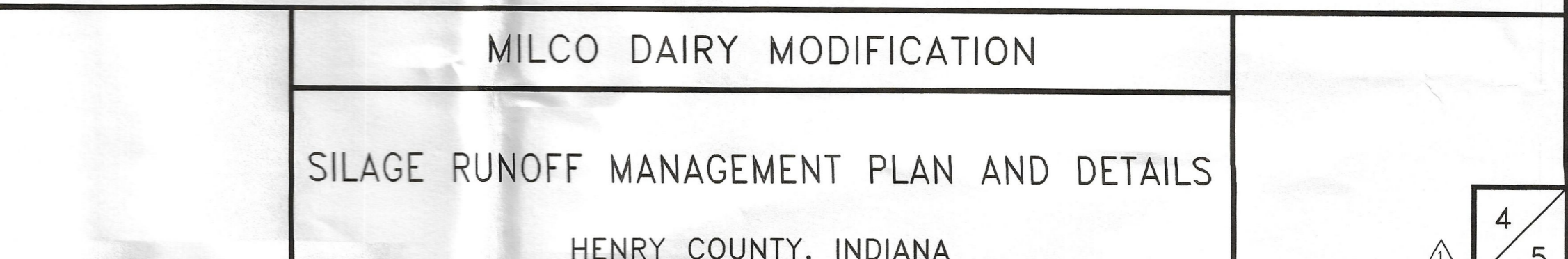
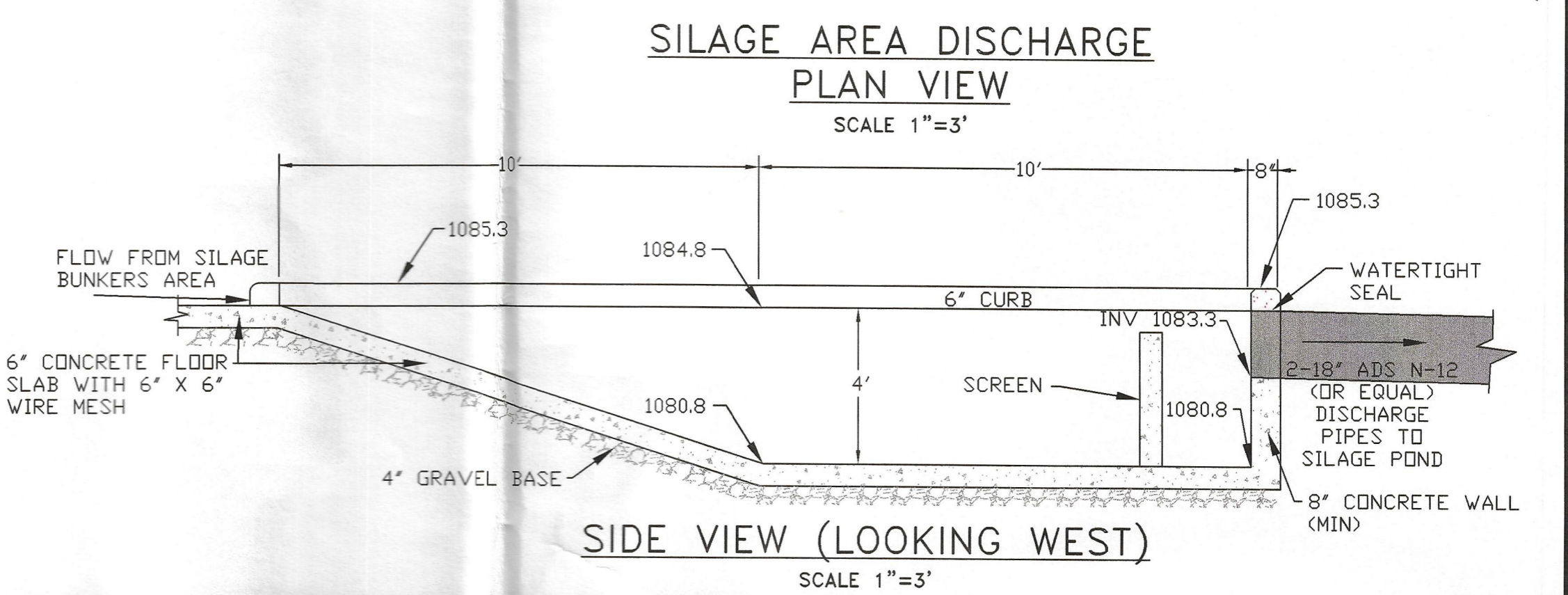
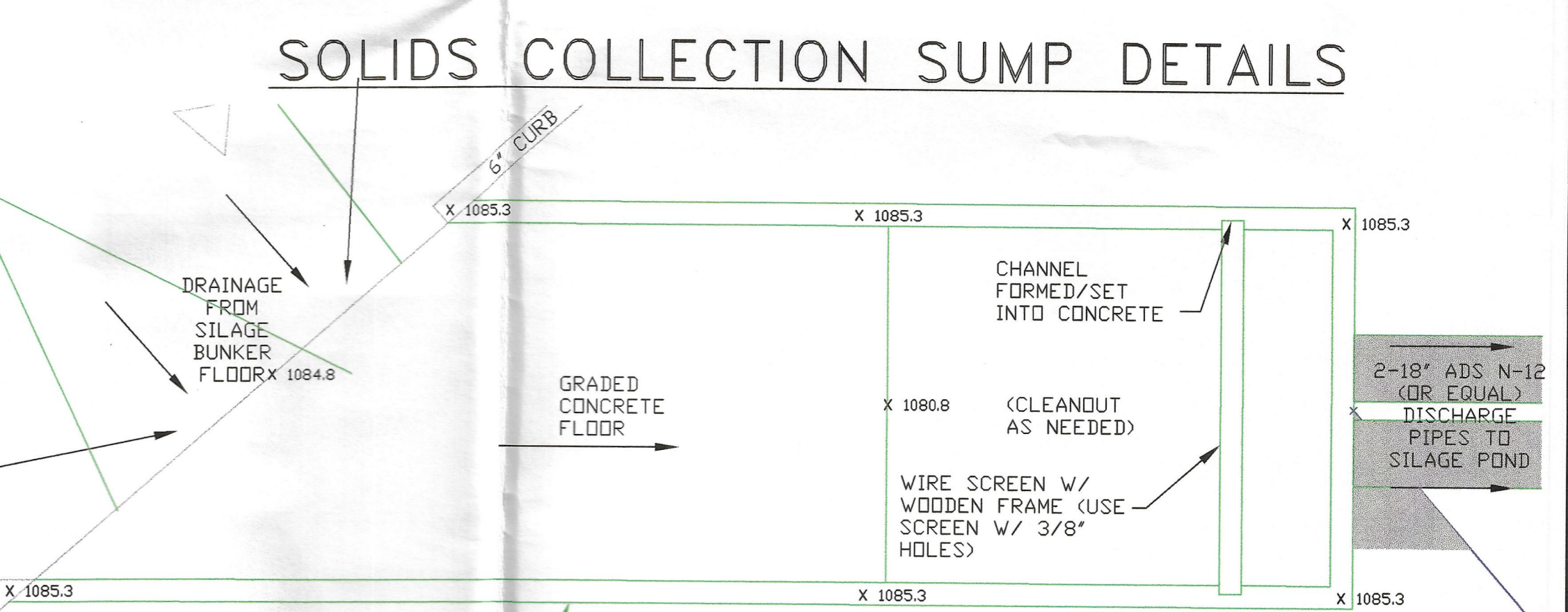
STEP 2

SIZE OUTFALL PIPE TO PASS PEAK FLOW FROM 25 YEAR/24 HOUR FLOW

USE ADS (OR EQUAL) SMOOTH WALL 18" AT A MINIMUM 1.0% SLOPE

PIPE SIZE MAY BE REDUCED IF SLOPE IS INCREASED

FLOW = 11.4 cfs @ 6.4 ft/sec VELOCITY (USE TWO PIPES)



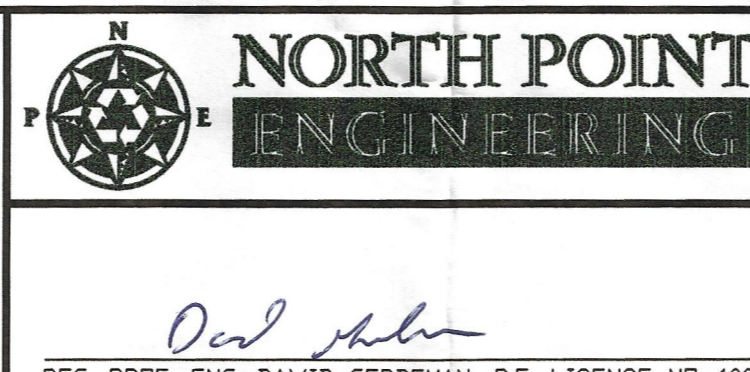
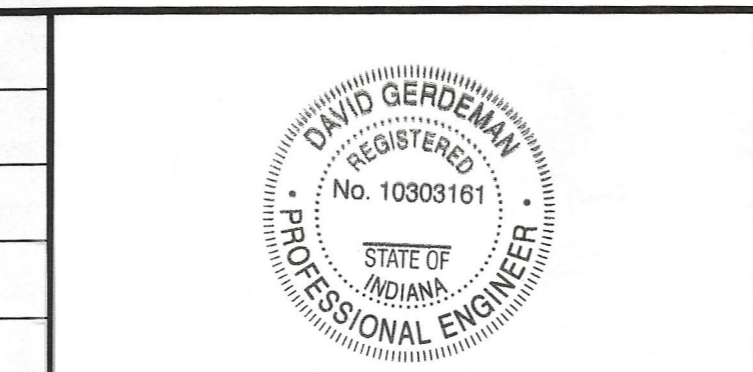
REVISIONS

NUMBER	DATE	MADE BY	CHECKED BY	DESCRIPTION
1	8-11-05	DRB	DAG	ADDED SEEPAGE CALC, OPEN CHANNEL DETAIL, REVISED BASEMAP, CORRECTED SHEET NUMBER
2	8-31-05	LMB	DAG	REVISED TO REFLECT BASEMAP CHANGES AND SILAGE CHANNEL DETAIL

DATE: 6-29-05

PREPARED BY:	DRAWN BY:	CHECKED BY:
DAG	DRB	

MIL005-04



MILCO DAIRY MODIFICATION

SILAGE RUNOFF MANAGEMENT PLAN AND DETAILS

HENRY COUNTY, INDIANA